CONTENTS

FIGURES

FIGURES (continued)

FIGURES (continued)

FIGURES (continued)

TABLES

TABLES (continued)

TABLES (continued)

3. WASTE AREA GROUP 7 DESCRIPTION AND BACKGROUND

The Radioactive Waste Management Complex (RWMC) is located in the southwestern quadrant of the Idaho National Laboratory (INL) Site. The RWMC encompasses 72 ha (177 acres) and is divided into three separate areas by function: the Subsurface Disposal Area (SDA), the Transuranic Storage Area (TSA), and the administration and operations area. The original landfill, established in 1952, was called the National Reactor Testing Station Burial Ground. Now part of the SDA, the original landfill covered 5.2 ha (13 acres) and was used for shallow land disposal of solid radioactive waste. In 1958, the disposal area was expanded to 35.6 ha (88 acres). In 1988, the security fence was relocated to outside the dike surrounding the disposal area, which expanded the SDA to the current size of 39 ha (97 acres). In approximately 14 of the 39 ha (35 of the 97 acres) in the SDA, waste is disposed of in pits, trenches, soil vaults, and Pad A.

The TSA was added to RWMC in 1970. The TSA is next to the eastern side of the SDA and encompasses 23 ha (58 acres). The Advanced Mixed Waste Treatment Facility within the TSA stores, prepares, and ships retrievable transuranic (TRU) waste to the Waste Isolation Pilot Plant (WIPP). The 9-ha (22-acre) administration and operations area at RWMC includes administrative offices, maintenance buildings, equipment storage, and miscellaneous support facilities. Figure 3-1 provides a detailed map of the physical layout of all RWMC disposal locations and facilities, as well as facilities used to store radioactive and hazardous waste.

Section 3 provides a description and background of RWMC specific to the Operable Unit 7-13/14 comprehensive remedial investigation and feasibility study (RI/FS) and is organized as follows:

- Section 3.1 presents the operational background of RWMC, beginning with an analysis of collocated facilities and followed by descriptions of historical and current disposal practices, past waste retrievals, surface-cover maintenance, and subsidence
- Section 3.2 defines the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 USC § 9601 et seq., 1980) framework specific to RWMC and summarizes Waste Area Group 7 operable units
- Section 3.3 outlines the process followed in developing the source-term inventory from disposal records
- Section 3.4 summarizes Operable Unit 7-13/14 contaminant screening.

Sections 3.5 through 3.10 discuss results of several completed or ongoing investigations relevant to Operable Unit 7-13/14 comprehensive RI/FS decision-making and future remedial design and remedial action for the SDA. Some of these investigations are discussed in detail in published reports but are not summarized elsewhere in this remedial investigation and baseline risk assessment (RI/BRA). Therefore, these additional activities are summarized for completeness in the following sections:

- Section 3.5 summarizes geophysical investigations completed at the SDA since 1989
- Section 3.6 describes the SDA Probing Project and the ongoing data-collection process
- Section 3.7 describes actinide retardation studies performed to measure radionuclide retardation parameters for application to risk assessment at the SDA

- Section 3.8 describes analysis and leaching of Pit 9 waste samples
- Section 3.9 reviews and discusses results of ongoing C-14 and tritium monitoring near beryllium blocks
- Section 3.10 summarizes the SDA Criticality Safety Study
- Section 3.11 lists references for Section 3.

3.1 Operational Background

The Federal Facility Agreement and Consent Order (FFA/CO) (DOE-ID 1991) defined Waste Area Group 7 as (1) the RWMC facility, (2) the subsurface beneath RWMC into which contaminants may have migrated laterally or vertically, and (3) any contamination in the Snake River Plain Aquifer originating from RWMC. Recently, however, the U.S. Department of Energy (DOE), the Idaho Department of Environmental Quality (DEQ), and the U.S. Environmental Protection Agency (EPA) determined that Waste Area Group 7 should exclude the TSA. Therefore, the RI/BRA focuses on waste buried in the SDA. The following subsections summarize the Collocated Facilities Analysis (Sebo and Whitaker 2005) and describe past and current operations and practices relative to the Operable Unit 7-13/14 comprehensive RI/FS.

3.1.1 Analysis of Collocated Facilities for Waste Area Group 7

The RI/BRA focuses on risk to human health and the environment from waste buried in the SDA. In support of the RI/BRA, Sebo and Whitaker (2005) updated the Collocated Facilities Analysis and evaluated whether any current or inactive facilities, structures, or operations in or near RWMC could affect cumulative risk or effectiveness of future remedial action. For the RI/BRA, a collocated facility is defined as a building, structure, or process that (1) is proximal to or shares the same area as Waste Area Group 7 and (2) may contribute to cumulative environmental impacts.

A four-step screening process was used in the analysis:

1. Step 1: Criterion 1—eliminated from further consideration any building or structure that had never processed, used, or stored hazardous material
2. Step 2: Criterion 2—eliminated buildings or structures that housed hazardous or radioactive material below threshold quantities, as specified in Superfund Amendment and Reauthorization Act Title III (Public Law 99-499)
3. Step 3: Criterion 3—eliminated buildings and structures that historically had used, processed, or stored hazardous material, but that were operated with appropriate controls (i.e., measures to prevent or mitigate releases to the environment)
4. Step 4: Criterion 4—eliminated buildings or structures that have processed or currently process, use, or store radiological material regulated under the Resource Conservation and Recovery Act (RCRA) (42 USC § 6901 et seq., 1976), but that are operated with appropriate controls and mitigation plans following current guidance and requirements.

Approximately 100 buildings and structures at RWMC (see Figure 3-1) were evaluated for their potential contribution to cumulative risk for Waste Area Group 7. The Collocated Facilities Analysis (Sebo and Whitaker 2005) concluded that all facilities, structures, and operations in or near RWMC could be eliminated as contributors to Waste Area Group 7 cumulative risk by satisfying requirements of one of the screening criteria. None of the collocated facilities were found to pose a potential effect on cumulative risk at Waste Area Group 7 or to pose an imminent threat of hazardous release. Table 3-1 summarizes analysis results. Many of the facilities are administrative, maintenance, or storage buildings that pose no risk to the environment. Though substantial waste inventories are stored at the TSA, facilities containing waste are managed under RCRA permits and other controls and will be closed in accordance with RCRA requirements. Therefore, these facilities will not affect cumulative risk for Waste Area Group 7.

3.1.2 Historical Operations from 1952 to 1985

The History of RWMC (INEL 1985) discusses past operations in terms of the following four intervals:

- Early disposal operations—1952 through 1959
- Interim operations—1960 through 1963
- Mid- to late-1960s operations—1964 through 1969
- Late operations—1970 through 1985.

Interval identifications were based on disposal practices and waste received during that period. Information in the following subsections was obtained from the History of RWMC (INEL 1985).

3.1.2.1 Disposals from 1952 to 1959. The original National Reactor Testing Station landfill, now known as the SDA, was established in 1952. The landfill was managed and operated by the U.S. Atomic Energy Commission (i.e., predecessor to DOE). The first trench was opened for disposal of solid waste in July 1952. The Acid Pit, located outside the original disposal area, began receiving waste in 1954. Between 1952 and 1957, Trenches 1 through 10 were excavated to basalt, with average dimensions of 1.8 m (6 ft) wide, 274.3 m (900 ft) long, and 3.7 m (13 ft) deep. In 1957, Pit 1 was excavated to bury large bulky items. When Pit 1 was excavated, space in the original landfill was nearly consumed; therefore, the landfill was expanded in 1958 to 36 ha (88 acres). The Acid Pit, no longer outside the disposal area, was incorporated into the SDA.

During this early disposal period, waste was classified as either routine or nonroutine. Routine solid waste was identified, based on exposure relative to daily occupational limits. Routine solid waste, which typically consisted of paper, laboratory glassware, filters, metal pipe fittings, and other items contaminated by mixed fission products during National Reactor Testing Station operations, was packaged in cardboard boxes. Boxes were taped shut and collected in dumpsters, which eventually were emptied into trenches. Nonroutine solid waste was defined as waste that could cause excessive exposure to personnel. Nonroutine solid waste was placed either in wooden boxes or in garbage cans. Special transport containers and vehicles hauled the waste to the disposal site. Before 1957, the radiation level was not limited for any disposal, and items registering up to 12,000 R/hour were buried. Both nonroutine and routine solid waste types were covered with soil, but in accordance with different schedules. Nonroutine solid waste was covered immediately; whereas, boxes containing routine solid waste may have been left exposed until the end of an operating week. Because disposal documentation forms were not required until 1959, early disposal records are incomplete. In 1959, procedures were standardized, routine and nonroutine solid waste were formally defined, and disposal forms were required.

During this early waste disposal period, the National Reactor Testing Station also accepted waste shipments from Rocky Flats Plant for permanent disposal, under authorization of the U.S. Atomic Energy Commission. From 1954 to 1957, Rocky Flats Plant TRU-contaminated waste, packaged in drums or wooden crates, was stacked horizontally in pits and trenches with National Reactor Testing Station mixed-fission-product waste. Therefore, most pits and trenches in the original landfill (e.g., Trenches 1 through 10 and Pit 1) contain National Reactor Testing Station waste interspersed with TRU-contaminated waste from Rocky Flats Plant (see Figure 3-1). Records for Rocky Flats Plant disposals did not accompany those shipments. Instead, an annual summary of disposals provided total radionuclide content and waste volume.

Originally, trench locations were identified and recorded by metal tags placed at regular intervals along the barbed-wire enclosure that surrounded the landfill. This procedure was discontinued in the late 1950s, and concrete survey monuments were placed at the ends of the centerline of each trench and at the corners of each pit. A brass plate was affixed to each monument and stamped with the trench or pit number, dates indicating when the trench or pit was opened and closed, and a direction arrow. Older disposal sites were retrofitted with monuments, but accuracy of the locations is uncertain.

3.1.2.2 Disposals from 1960 to 1963. In late 1959, the U.S. Atomic Energy Commission determined that land disposal was preferable to offshore ocean disposal of solid radioactive waste. However, a commercially operated land disposal site was not available to private industries licensed by the U.S. Atomic Energy Commission. Therefore, the U.S. Atomic Energy Commission created an interim program for disposal of solid radioactive waste generated by U.S. Atomic Energy Commission licensees, while commercial sites were selected and established. The National Reactor Testing Station and Oak Ridge National Laboratory were selected as interim disposal sites. From 1960 until commercial burial sites became available in 1963, the National Reactor Testing Station accepted approved shipments from off-INL Site generators. Because of security concerns, waste shipments from Rocky Flats Plant to the National Reactor Testing Station continued after commercial sites opened.

During the early 1960s, several changes occurred in National Reactor Testing Station waste disposal operations. First, the U.S. Atomic Energy Commission delegated authority to manage and operate the landfill to the National Reactor Testing Station operating contractor, Phillips Petroleum Company. Tasks managed under this authority included radiological surveillance and arrangements for nonstandard disposals. The contractor refined and formalized standard practices for disposal operations and implemented a system of careful recordkeeping. Another change in disposal practices affected physical burial of TRU waste from Rocky Flats Plant. Beginning in November 1963 (and continuing until 1969), drums containing waste from Rocky Flats Plant were dumped into pits rather than stacked to reduce labor costs and personnel exposure. Environmental monitoring systems were improved by placing 35 film badges around the perimeter of the facility.

From 1960 to 1963, when the interim program was active, Trenches 16 through 25 and Pits 2 through 5 were open for disposal (see Figure 3-1). These excavations received some mixture of stacked or dumped Rocky Flats Plant TRU-contaminated waste, National Reactor Testing Station waste, and off-INL Site waste. During this period, TRU waste was defined as waste containing concentrations greater than 10 nCi/g of any isotopes with an atomic number greater than 92.

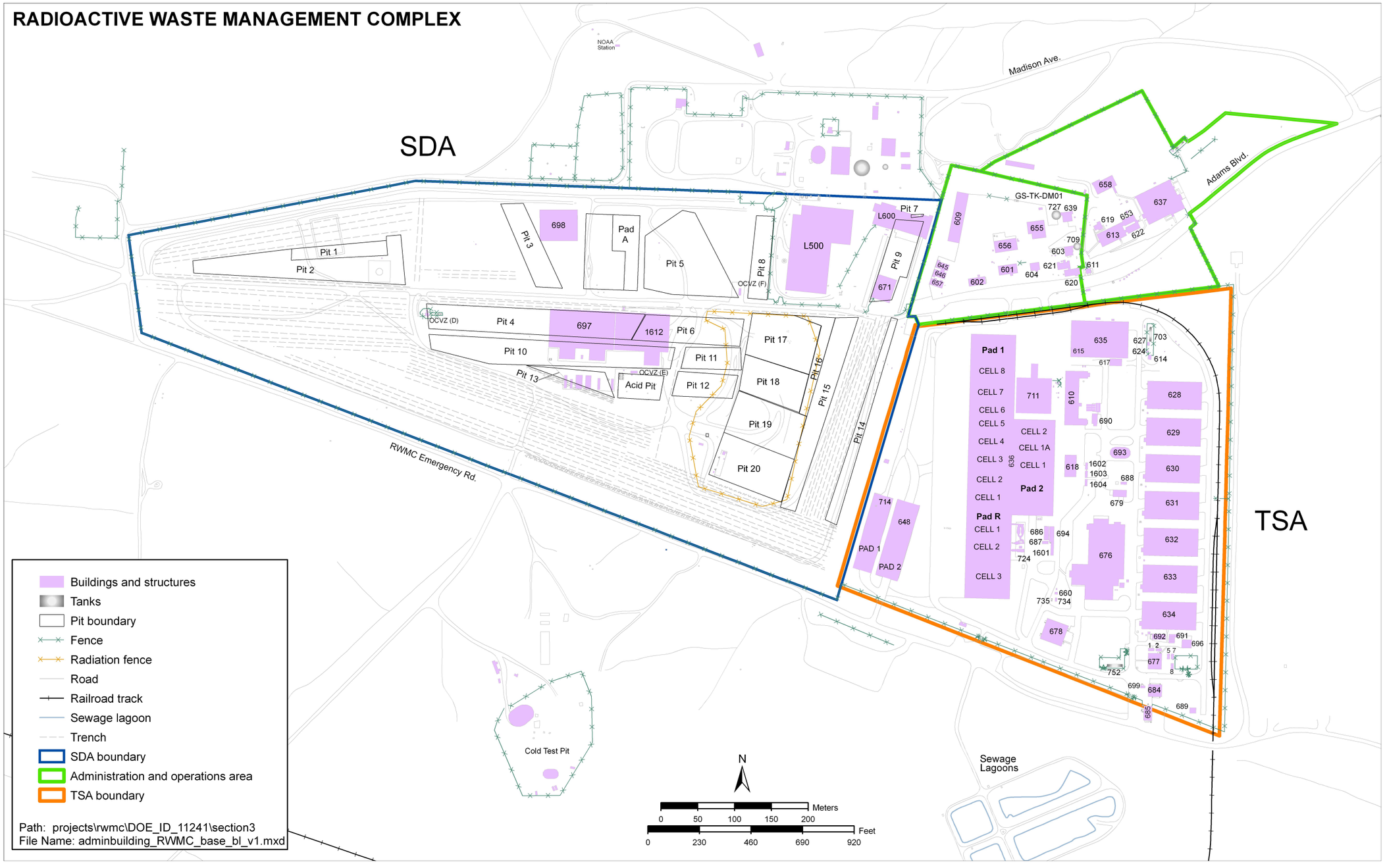

Figure 3-1. Facilities and structures within the Radioactive Waste Management Complex.

Table 3-1. Summary of Waste Area Group 7 collocated facilities.

Facility Number	Facility Name	Location	Criterion[a]
WMF-601	Radiological Control Field Office	Operations Area	2
WMF-602	RWMC Highbay	Operations Area	2
WMF-603	RWMC Pumphouse	Operations Area	1
WMF-604	Change Room and Lunchroom Building	Operations Area	1
WMF-605	USGS Well House 87	Outside	1
WMF-606	USGS Well House 88	Outside	1
WMF-609	Heavy Equipment Storage Building	Operations Area	2
WMF-609A, WMF-609B	RCRA 90-day Storage Area	Operations Area	3
WMF-610	Stored Waste Examination Pilot Plant Building	TSA	4
WMF-611	Operations Support Facility	Administration Area	1
WMF-613	Office Building and Operational Support Facility	Administration Area	1
WMF-614	Propane Vaporizer Housing (shed)	TSA	3
WMF-615	Stored Waste Examination Pilot Plant Drum Venting System Building	TSA	4
WMF-617	Stored Waste Examination Pilot Plant Maintenance Facility	TSA	2
WMF-618	Transuranic Packaging and Transporter II Container Loading Facility	TSA	4
WMF-619	Communications Building and Dial Room	Administration Area	1
WMF-620	Work Control Center Facility (Operations) Trailer	Operations Area	1
WMF-621	Work Control Center Support Facility (Operations) Trailer	Operations Area	1
WMF-622	Office Annex Trailer	Administration Area	1
WMF-624	Fire Riser Enclosure	TSA	1
WMF-627	Propane Pump Enclosure	TSA	3
WMF-628	Type II Storage Module No. 1	TSA	4
WMF-629	Type II Storage Module No. 2	TSA	4
WMF-630	Type II Storage Module No. 3	TSA	4
WMF-631	Type II Storage Module No. 4	TSA	4
WMF-632	Type II Storage Module No. 5	TSA	4
WMF-633	Type II Storage Module No. 6	TSA	4
WMF-634	Type II Storage Module No. 7	TSA	4
WMF-635	Type I Storage Module	TSA	4
WMF-636	TSA Retrieval Enclosure	TSA	4
WMF-637	Operations Control Building	Administration Area	1
WMF-639	Firewater Pumphouse No. 2	Operations Area	3

Table 3-1. (continued).

Facility Number	Facility Name	Location	Criterion[a]
WMF-641	Vapor Vacuum Extraction Monitoring Well D02	SDA	1
WMF-642	Vapor Vacuum Extraction Monitoring Well 88-01D	SDA	1
WMF-643	Vapor Vacuum Extraction Monitoring Well 7V	SDA	1
WMF-645	Construction Support Trailer	Operations Area	1
WMF-646	Field Support Trailer	Operations Area	1
WMF-648	Intermediate-Level Transuranic Storage Facility Trailer	TSA	1
WMF-653	Office Annex No. 2 Trailer	Administration Area	1
WMF-655	Material Handling Facility	Operations Area	2
WMF-656	Maintenance Facility	Operations Area	2
WMF-657	Construction Field Support Trailer	Operations Area	1
WMF-658	RWMC Office Building	Administration Area	1
WMF-660	Automatic Transfer Switch Building	TSA	1
WMF-661	Hazardous Materials Storage	Operations Area	2
WMF-664	Warehouse	LMAES Area	1
WMF-665	Truck Off-Loading Facility	LMAES Area	1
WMF-666	Retrieval Building	LMAES Area	1
WMF-667	Treatment/Processing Building	LMAES Area	1
WMF-668	Utility Building	LMAES Area	1
NA	Radiological Control Trailer	LMAES Area	1
NA	Operations Office	LMAES Area	1
NA	Cooling Tower Building	LMAES Area	1
NA	Vehicle Maintenance Shop	LMAES Area	1
NA	Carpenter Shop	LMAES Area	1
WMF-671	Weather Enclosure Structure	SDA	4
WMF-676	Advanced Mixed Waste Treatment Project Facility	TSA	4
WMF-677	Advanced Mixed Waste Treatment Project Office Complex	TSA	1
WMF-678	Advanced Mixed Waste Treatment Project Office Complex	TSA	1
WMF-679	Advanced Mixed Waste Treatment Project Workshop	TSA	2
WMF-680	Building Trailer	TSA	1
WMF-681	Building Trailer	TSA	1
WMF-684	Assembly/Break Building	TSA	1
WMF-685	Accountability Building	Outside	1
WMF-686	Advanced Mixed Waste Treatment Project Shower Trailer	TSA	1
WMF-687	Break Trailer – Retrieval Staff	TSA	1
WMF-688	Break Trailer	TSA	1

Table 3-1. (continued).

Facility Number	Facility Name	Location	Criterion[a]
WMF-689	Rolling Stock Maintenance Facility	TSA	2
WMF-690	Carpenter Shop	TSA	2
WMF-691	Warehouse Office Trailer	TSA	1
WMF-692	Site Warehouse	TSA	2
WMF-693	Consumable Storage	TSA	2
WMF-694	Training Facility	TSA	1
WMF-696	Storage Facility	TSA	2
WMF-697	Retrieval Enclosure (Targeted Waste Removal and Disposition Project)	SDA	4
WMF-698	Storage Enclosure (Targeted Waste Removal and Disposition Project)	SDA	4
NA	Two propane tanks west of WMF-697	SDA	1
NA	Four propane tanks south of WMF-697	SDA	1
WMF-699	Assembly Trailer Restroom	TSA	1
WMF-703	Propane Storage Tank	TSA	1
WMF-709	Water Storage Tank	Operations Area	1
WMF-711	Air Support Building II Foundation, Floor, and Airlock	TSA	4
WMF-714	Intermediate-Level Transuranic Storage Facility Pad 1	TSA	4
WMF-720	Intermediate-Level Transuranic Storage Facility Pad 2	TSA	4
WMF-723	TSA Retrieval Airlock	TSA	4
WMF-724	Glycol Loop Enclosure	TSA	1
WMF-727	Firewater Storage Tank	Operations Area	1
WMF-731	RWMC Sewage Lagoon	Outside	1
WMF-732	Propane Tank	Administration Area	1
WMF-734	Standby Generator Enclosure	TSA	1
WMF-735	Diesel Tank	TSA	1
WMF-737	Fuel Tank	Operations Area	1
WMF-738	Propane Tank	Operations Area	1
WMF-750	Temporary Fire Riser Building	Operations Area	1
WMF-752	Propane Storage Tank	TSA	1
WMF-1601	Training Office Trailer	TSA	1
WMF-1602	Break Room Trailer	TSA	1
WMF-1603	Break Room Trailer	TSA	1
WMF-1604	Shift Team Lead Office Trailer	TSA	1
WMF-1612	Retrieval Enclosure (Targeted Waste Removal and Disposition Project, Phase II)	SDA	4

Table 3-1. (continued).

Facility Number	Facility Name	Location	Criterion[a]
WMF-TR-1	Targeted Waste Removal and Disposition Project Sample Support Trailer	SDA	1
WMF-TR-2	Targeted Waste Removal and Disposition Project Operations Support Trailer	SDA	1
WMF-TR-3	Targeted Waste Removal and Disposition Project Nondestructive Assay East Trailer	SDA	1
WMF-TR-4	Targeted Waste Removal and Disposition Project Nondestructive Assay West Trailer	SDA	1
WMF-TR-6	Targeted Waste Removal and Disposition Project Men's Change Trailer	SDA	1
WMF-TR-7	Targeted Waste Removal and Disposition Project Women's Change Trailer	SDA	1
WMF-CT-1	Commissioning Trailer #1	TSA	1
WMF-CT-2	Commissioning Trailer #2	TSA	1
WMF-CT-5	Commissioning Trailer #5	TSA	1
WMF-CT-7	Commissioning Trailer #7	TSA	1
WMF-CT-8	Commissioning Trailer #8	TSA	1
NA	Diesel Tanks	SDA	3
NA	North Administrative Trailer – Cold Test Pit-North	Outside	1
NA	Support Trailer – Cold Test Pit-North	Outside	1
NA	South Administrative Trailer – Cold Test Pit-South	Outside	1
NA	North Yurt – Cold Test Pit-North	Outside	3
NA	South Yurt – Cold Test Pit-South	Outside	1
NA	North Test Pits – Cold Test Pit-North	Outside	3
NA	South Test Pits – Cold Test Pit-South	Outside	3
NA	Cold Test Pit-North	Outside	3
NA	West Storage Area	Outside	1

a. Screening criteria are as follows:

(1) Eliminated from further consideration any building or structure that had never processed, used, or stored hazardous material

(2) Eliminated buildings or structures that housed hazardous or radioactive material below threshold quantities, as specified in Superfund Amendment and Reauthorization Act Title III (Public Law 99-499)

(3) Eliminated buildings and structures that historically had used, processed, or stored hazardous material, but that were operated with appropriate controls (i.e., measures to prevent or mitigate releases to the environment)

(4) Eliminated buildings or structures that have or currently process, use, or store radiological material or RCRA-regulated hazardous waste, but that are operated with appropriate controls and mitigation plans following current guidance and requirements.

LMAES = Lockheed Martin Advanced Environmental Systems
RCRA = Resource Conservation and Recovery Act
RWMC = Radioactive Waste Management Complex
SDA = Subsurface Disposal Area
TSA = Transuranic Storage Area
USGS = U.S. Geological Survey

3.1.2.3 Disposals from 1964 to 1969. By the mid-1960s, concern about environmental impacts of waste disposal significantly influenced waste management practices. Disposal practices, monitoring systems, and adequacy of facilities were subjected to critical scrutiny, which resulted in passage of environmental legislation to protect the environment. Maintaining water quality in the Snake River Plain Aquifer always has been a concern. Numerous studies conducted by various agencies concluded that previous burial of radioactive waste did not generate off-INL Site health or safety problems. However, several improvements were recommended to monitor and mitigate potential effects from continuing to bury waste.

Modifications to procedures for permanent disposal included increasing the minimum trench depth of 0.9 m (3 ft) to 1.5 m (5 ft), lining the bottoms of excavations with at least 0.6 m (2 ft) of underburden, compacting waste by dropping a heavy steel plate on waste dumped in trenches, and increasing soil cover over each disposal area from a minimum soil cover of 0.6 m (2 ft) to 0.9 m (3 ft). These modifications were implemented between 1964 and 1970 when Trenches 33 through 49 were open. Information is not available about specific trenches compacted with the steel plate. In addition, burial of TRU waste—defined as having concentrations greater than 10 nCi/g of any TRU isotope—was discontinued in 1970. Instead, TRU waste was transferred to the TSA for retrievable storage.

According to INEL (1985), the environmental monitoring program was revised during this period. The 35 film badges around the perimeter of the landfill were replaced with 18 thermoluminescent dosimeters. Water samples were collected and analyzed from subsurface monitoring holes, in addition to field investigations to assess leaching. The report concludes that specific threats to the aquifer had not been identified.

3.1.2.4 Disposals from 1970 to 1985. The greatest departure from previous disposal practices during this period was implementing the 1970 U.S. Atomic Energy Commission "Policy Statement Regarding Solid Waste Burial" (AEC 1970). This policy required segregated and retrievable storage of all solid TRU waste. Originally, TRU waste was defined as all waste contaminated with TRU radionuclides in concentrations greater than 10 nCi/g (AEC 1973). In 1982, TRU waste was redefined as waste material containing any alpha-emitting radionuclide with an atomic number greater than 92, a half-life longer than 20 years, and a concentration greater than 100 nCi/g at the time of assay (DOE O 5820.1).

The effect of policy changes initiated several changes in waste disposal practices within the SDA over time and led to creation of the TSA. These changes are discussed in the following subsections.

3.1.2.4.1 Transuranic Storage Area Retrievable Waste Disposal, 1970 to 1985— After adopting the 1970 policy (AEC 1970), interim practices were implemented to facilitate storage and ". . . retrieval of contamination-free waste containers after periods of up to 20 years. . ." (INEL 1985). Most of these practices are still in use today. Abovegrade storage was selected for TRU interim storage; this resulted in establishing the TSA in late 1970. To implement the new policy during this period, structures were constructed within the TSA: several large asphalt storage pads, Intermediate-Level Transuranic Storage Facility, Stored Waste Examination Pilot Plant, and other structures.

Contact-handled waste stored at the TSA is currently being removed and shipped to WIPP (see Section 3.1.3.2.5). Therefore, this RI/BRA does not consider waste temporarily stored, and it does not address practices within the TSA in detail.

Generally, contact-handled TRU waste was primarily received from off-INL Site generators and placed in interim storage from 1970 to 1982 on TSA Pads 1, 2, and R (see Figure 3-1). This waste was packaged in containers, stacked in subdivided areas called cells, and covered with dirt. In some cases, layers of waste were separated by fire-retardant plywood. At TSA Pad 1, cells were segregated by earthen

firebreaks. A final cover of wood, plastic sheeting, and soil seeded with grass was placed over each cell when it was filled to capacity. Operations at TSA Pads 1 and R were conducted in the open and exposed to weather. A movable air-support weather shield was constructed over the southern portion of TSA Pad 2 in 1975, enabling all-weather operations. The air-support weather shield and storage operations were shifted from south to north as cells were filled. Earth-covered portions of TSA Pads 1, 2, and R were all closed by 1982.

Pad 3 in the TSA was constructed in 1983. Pad 3 provided the foundation for a second, much larger air-support weather shield, which was called the Stored Waste Examination Pilot Project Certification and Segregation Building (WMF-612). The Certification and Segregation Building (WMF-612) was built in 1985 over the southern two-thirds of Pad 3. Containers of contact-handled TRU waste were stored in WMF-612, pending examination and shipment or disposition (Hardy, Pickett, and Stanisich 1990; Schwaller 1991; Lugar 1994). In general, the Stored Waste Examination Pilot Plant examined containerized waste to verify compliance with waste acceptance criteria for WIPP. Waste containers were subjected to a series of tests to evaluate container integrity and to verify and assay container contents. The Certification and Segregation Building was deactivated, decontaminated, and decommissioned in 2000 to provide space for construction of the Advanced Mixed Waste Treatment Project.

The Intermediate-Level Transuranic Storage Facility was constructed to store TRU waste with beta or gamma emission levels requiring special handling and shielding. Exposure rates between 200 mR/hour and 4,500 R/hour at the container surface were specified originally. The upper exposure-rate limit was revised to 100 R/hour in 1982 to comply with revised WIPP waste acceptance criteria. The facility consists of two pads, one built in 1975 and one in 1985. The facility provides belowground interim storage in shielded vaults formed of steel pipes of varying diameters. Vaults are embedded in a compacted earthen embankment and covered by two asphalt pads. Asphalt allows use of heavy machinery during waste unloading and retrieval operations.

3.1.2.4.2 Subsurface Disposal Area Operations from 1970 to 1985—Since 1970, solid TRU waste received at RWMC has been segregated from non-TRU solid waste and placed in interim storage at the TSA. Low-level waste (LLW) at RWMC, contaminated with TRU isotopes in concentrations greater than 10 nCi/g but less than or equal to 100 nCi/g, also was excluded from disposal in the SDA and was placed in interim storage at the TSA. Only LLW contaminated with TRU isotopes less than or equal to 10 nCi/g was buried in the SDA.

A pad was constructed within the SDA in an area unsuitable for subsurface disposal because of shallow surficial sediment. Originally called the Engineered Waste Storage Area, it was later called the Transuranic Disposal Area and is now called Pad A (see Figure 3-1). See Section 3.2.12 for more information about Pad A, which is designated as Operable Unit 7-12.

From 1970 to 1985, SDA disposal practices were modified—including compacting, packaging criteria, and enlarging pit volumes—because of concern about space availability. The Naval Reactors Facility (NRF) began compacting its disposals in 1971. By 1974, design criteria developed by NRF were used to design a system installed at RWMC. Waste generators at the INL Site, except NRF, began sorting their own waste and shipping non-TRU compactable waste to RWMC in plastic bags, which expedited compaction operations. Packaging criteria were modified in 1978 to facilitate stacking in a close-packed array within the pits. Pits were expanded by removing fractured basalt from the base of the excavations using heavy equipment. Beginning with Pit 17 in 1980, explosive fracturing was used to deepen pit excavations. A soil underburden at least 0.6 m (2 ft) thick was added to cover basalt before waste was buried, and a final layer of compacted soil at least 0.9 m (3 ft) thick was added to cover waste after burial. In combination, the above practices greatly expanded usable space and significantly extended the operational lifetime of the SDA.

Disposal practices also were modified to minimize personnel exposures to radiation emanating from waste. Beginning in 1977, areas not suited for pits were reserved for soil vault rows (SVRs), typically used for burial of remote-handled waste. Drilled in rows, soil vaults consisted of unlined, cylindrical, vertical holes drilled in the soil, ranging from 0.4 to 2 m (1.3 to 6.5 ft) in diameter and from 5.2 to 7.6 m (17 to 25 ft) deep. Vaults in any given row are at least 0.6 m (2 ft) apart. A layer of soil at least 0.6 m (2 ft) thick was placed in the bottoms of holes, when basalt was penetrated during drilling, before emplacing waste. Soil vaults were designed for burying high-radiation waste, which was defined as material producing a beta-gamma exposure rate greater than 500 mR/hour at a distance of 0.9 m (3 ft). Full vaults were covered with at least 0.9 m (3 ft) of soil. Additional soil was added, when necessary, to reduce exposure rate above the covered vault to less than 1 mR/hour at the soil surface. Soil vaults are inspected and maintained periodically to ensure they have adequate soil cover. Though records of exact soil-cover thicknesses are not maintained, most soil vaults have at least 1.8 m (6 ft) of cover.

Disposals in trenches were conducted concurrently with disposals in soil vaults from 1977 to 1981. Trenches also received high-radiation waste until trench-disposal was discontinued in 1981.

General disposal practices were the same for pits and trenches. Compacted waste was baled, larger bulky items were wrapped in plastic, and smaller noncompactable waste was contained in wooden boxes covered with fire-retardant paint. Waste was placed into the excavations by free-air transfer or in shielded casks, depending on the exposure rate measured on the outside of the waste container. Records are not clear regarding casks; records also noted other objects, such as waste inserts and cribs. Anecdotal information indicates that casks and inserts, meaning sealed containers, were disposed of, while cribs were typically lifted and moved to new locations for reuse (see Figure 3-2). Both free-air and shielded types of waste were buried in separate areas within a given excavation. As each excavation became full, the disposal area was crowned with a final compacted soil cover at least 0.9 m (3 ft) thick.

3.1.3 Radioactive Waste Management Complex Operations from 1985 to Present

A variety of waste is received at RWMC for storage, examination, or disposal. Documentation accompanying each waste shipment is reviewed on arrival, and the shipment is examined visually for discrepancies and damage. Radiological surveys ensure that radiation and contamination readings meet INL Site Waste Acceptance Criteria (DOE-ID 2005a) and the RWMC Safety Analysis Report (INEEL 2000). If any abnormalities are discovered, either in the waste or in associated documentation, they are resolved with the waste generator before the waste is formally accepted at RWMC. Once accepted, waste is transferred to the SDA or TSA, as appropriate.

Disposal practices have evolved since 1985, including changes in disposal facility, waste treatment, and containers. Information about RWMC operations from 1986 to the present was taken from the RWMC Safety Analysis Report (INEEL 2000), Annual Performance Assessment and Composite Analysis Reviews (Parsons, Seitz, and Keck 2005), Interim Closure Plan (Seitz, Keck, and McCarthy 2001), and Collocated Facilities Analysis (Sebo and Whitaker 2005). Some information from these documents is summarized briefly in the following discussion, which is subdivided into (1) disposal within the SDA, (2) operations within the TSA, and (3) activities within the administrative area.